

SECTION 2

MINIMUM REQUIREMENT #1

PREPARATION OF STORMWATER SITE PLANS

STORMWATER SITE PLANNING PROCESS

The City of Monroe has adopted the 2005 Washington State Department of Ecology Stormwater management Manual for the Puget Sound Basin as the governing design document for surface runoff control. The following is a listing of the applicable minimum "core" and "special" requirements outlined in Chapter 1 of the manual, with a brief description of how each was addressed:

- ***Step 1: Collect and Analyze Information on Existing Conditions***

Runoff can be expected to follow the existing ground topography, and flow in a southeastern direction for the south basin, and a northwestern direction for the north basin. As site slopes in the project clearing area are flat to moderate (0%-15%), and the area to be cleared is large with long reaches of drainage courses, there is medium to high potential for erosion. This can be easily controlled with erosion control measures, as slopes are very consistent.

Site Soils below the topsoil layer consist of Vashon Lodgment Till. This material is an unsorted mixture of loose to medium dense, reddish brown to tan silty sand with gravel and scattered cobbles and boulders. Below depth ranging from approximately 2-4 feet, these sediments became dense to very dense and grayish tan. The Vashon lodgment till consists of an unsorted mixture of silt, sand and gravel that was deposited directly from basal, debris laden glacial ice during the Vashon Stage of the Fraser Glaciation, approximately 12,500 to 15,000 years ago. The high relative density characteristic of the lodgment till is due to its consolidation by the massive weight of ice from which it was deposited. These deposits are generally dense to very dense and are of extremely low permeability in their native undisturbed state.

- ***Step 2: Prepare a Preliminary Development Layout***

The layout for the site is controlled primarily by the on-site utility easements and the exterior boundaries of the parcels, there are no site wetlands. The Project drainage is in two basins, with the south basin flowing into the project's large detention pond and then to the adjacent plat drainage system, and the north basin flowing to the north at or below pre-existing flow rates per the 2005 DOE manual. Site access is limited to the one public road that connects to the parcel, and a secondary easement road that connects the site to Chain Lake Road to the North.

- ***Step 3: Perform Offsite (Upstream and Downstream) Analysis***

There are some small upstream basins to the site to the east and west that flow overland onto the site. They are shown in Appendix 2-A. As they are small in nature, we will allow the onsite drainage system to capture the sheet flow from the adjacent properties and allow it to be routed thru our drainage system. The South basin upstream basin is 1.89 acres in size, and the north basin upstream is 0.49 acres. These areas will simply be added in both the existing and mitigated basins as forested, thus the detained volume will be unchanged.

The two downstream drainage courses (north and south) are similar in nature. The south Basin downstream is thru the adjacent plat of Sinclair Heights and is almost completely in pipes and open ditches. The north downstream basin flows to the Chain Lake Roadside ditch, then under Chain lake road to an adjacent wetland, and then to the north and west. Both are analyzed in detail below, with exhibits in the appendix.

South Basin:

The downstream flow from the project starts in the adjacent wetland, tract 996, of the adjacent Sinclair Heights Subdivision. Flows continue SE in the wetland to an 18" ductile iron culvert under 199th avenue (Photos 1 and 2) to the wetland in Tract 997, flows then continue due south in

the wetland where they enter another 18" ductile Iron culvert under Rainier Road NE (Photos 3 and 4), and into another small wetland. After flowing sw in the wetland flows enter an 18" concrete culvert that goes under the walkway for Sinclair Heights (photos 5 and 6) along the south property line. After this, flows continue sw to a private 18" culvert to the chain lake r/w. From here flows travel in the se direction along the n side of Chain lake Road in a series of 18" pipes and roadside ditches until they turn due west into a large wetland. (photos 7-12) Flows continue to the west along the north side of the church and eventually enter the lakeside parcel, flow south under highway 2 and eventually into the Snohomish river.



Photo #1, pipe out of tract 996



Photo #2, 18" ductile out of tract 996, into 997 (under 199th ave)



Photo #4, 18" ductile iron out of tract 997 (Under Rainier Road)



Photo #5, outfall of pipe under Rainier Road



Photo #6, Inlet of 18" HDPE under Sinclair Heights Walkway



Photo #7, outlet of 18" HDPE under Sinclair Heights Walkway



Photo #8, outlet of 18" HDPE culvert on private property between Sinclair Heights and Chain Lake Rd. R/W



Photos of pipes and ditch along N side of Chain lake Road, Top left, followed by top left followed by bottom lt and finally bottom rt.



Photos of pipes and ditch along N side of Chain lake Road, Top left, followed by top left followed by bottom lt and finally bottom rt.

North Basin:

Flows from the north basin will flow to the north to the Chain Lake Road Ditch. This path will be almost entirely sheet flow except for the proposed road connection with Chain Lake Road.

- **Step 4: Determine Applicable Minimum Requirements**

As the site is 35 acres and is proposing 146 lots, all 10 minimum requirements apply.

- **Step 5: Prepare a Permanent Stormwater Control Plan**

The site is currently mostly forested and wooded with some pasturelands in the southern portions of the site. There is a utility easement in the middle of the site on a N-S bearing that has a gravel maintenance road within it. This gravel road connects to chain lake road to the north. The site has two drainage basins, one that drains to the south toward the Sinclair Heights project, and one to the north that drains overland to the north, towards Chain Lake Road. The south basin that contains the vast majority of the site, will contain a large detention pond. This pond will be located at the south end of the site and will be made completely of earthen berms and cut slopes. The pond will have 1' of dead storage for sediment removal and a biofiltration swale downstream of the detention pond. The biofiltration swale will discharge to a level spreader which will disperse flows into the adjacent wetland to the south of the site. The pond will be fitted with an emergency overflow structure, or "Bird Cage" that will be fitted on the drop T orifice release structure, and then a secondary emergency overflow spillway over the south bank of the detention pond. This secondary emergency overflow will be armored with quarry spalls and will also drain south into the adjacent wetland. The detention pond has been designed utilizing the latest version of WWHM3 continuous storm modeling software as per the 2005 DOE manual for existing versus proposed drainage release rates. The point of compliance is the location where the flows leave the proposed level spreader, which is the southernmost portion, and the point of the lowest elevation of the site.

The northern basin which is a very small portion of the site (3.6 acres of the total 35 acres), will be released to the north in its natural drainage course toward Chain Lake Road. Of the developed portion of the north basin, only the downhill 0.83 acres will be released to the north. The remainder of the plat in the north basin (2.77 acres) will be diverted to the south basin and into the proposed detention pond. This is due to the fact that the several utility (natural gas, domestic water) easements within this north basin make it very difficult to design a detention system within this north basin. And by over detaining in the south basin, within the existing detention pond, we are able to eliminate the need for two detention systems. Thus providing a more cost efficient storm drainage system, with much less maintenance for the city of Monroe and the homeowners association to operate and maintain. This 0.83 acres was chosen to keep the developed release rates .vs. pre-developed rates to the north basin within the guidelines of the 2005 DOE manual, thus meeting all Point of Compliance (POC) release rate criteria for the entire site, while utilizing one detention pond.

- **Step 6: Prepare a Stormwater Pollution Prevention Plan (SWPPP)**

The 12 step outline is included in section 3 of this report, the full SWPPP is included as Appendix 3-A.

- **Step 7: Complete the Stormwater Site Plan**

The stormwater site plan will be very similar to the plan developed at the preliminary stage of the project, as outlined above in step 5..

Conveyance System

A full conveyance analysis for the plat will be performed at construction review.